Economics
The Open-Access, Open-Assessment E-Journal

Discussion Paper
No. 2013-27 | April 10, 2013 | http://www.economics-ejournal.org/economics/discussionpapers/2013-27

Please cite the corresponding Journal Article at
http://www.economics-ejournal.org/economics/journalarticles/2014-7

Working-Week Flexibility: Implications for Employment and Productivity

Victoria Osuna

Abstract
This paper evaluates the implications for employment, productivity and wages of allowing for more flexibility in weekly hours worked introduced in the recent Spanish labour market reform ("the 2012 reform"). A crucial aspect of the model will be the extent to which firms will be able to choose the workweek when subject to demand shocks. The model is calibrated so that it reproduces the cross-sectional distribution of workweeks across plants and households and some features of the Spanish economy. The author compares the status quo steady-state, where a 40 hour workweek is imposed and no flexibility is allowed, with the steady state of economies with a higher degree of flexibility in weekly hours: the 2012 Reform, the Work sharing and the Full flexibility scenarios. She finds that the 2012 reform preserves employment and generates a 1.72% increase in productivity. In the work sharing scenario, the increase in employment (1.86%) comes at the expense of a lower productivity increase (1.31%) and a decrease in weekly hours worked (4%). Finally, the full flexibility scenario preserves employment and generates a substantial increase in productivity (2.6%) by allowing firms to completely adapt to changing economic conditions, by expanding or contracting the working week.

JEL E24 E60 J21
Keywords Workweek; wages; employment; productivity

Authors
Victoria Osuna, ✉ Department of Economics, Universidad Pablo de Olavide, Sevilla 41013, Spain, vosupad@upo.es

The author gratefully acknowledges the support from the projects PAI-SEJ513, P09-SEJ4546, ECO2009-13357 (V. Osuna). Her thanks to Samuel Bentolila and Juan Francisco Jimeno for all their comments and suggestions and to the audience at the XXV Moneda y Credito Symposium and the Economics Department at Universidad Pablo de Olavide. The usual disclaimer applies.

Citation Victoria Osuna (2013). Working-Week Flexibility: Implications for Employment and Productivity. Economics Discussion Papers, No 2013-27, Kiel Institute for the World Economy. http://www.economics-ejournal.org/economics/discussionpapers/2013-27

Received March 20, 2013 **Accepted as Economics Discussion Paper** April 9, 2013 **Published** April 10, 2013

1 Introduction

The “Great Recession" has revealed the poor performance of dual labor markets. The most striking case is that of the Spanish labour market. Up until recently, the Spanish labour market was one of the most dynamic in the European Area (EA). During the decade preceding the current crisis, and according to the European Labour Force Survey, almost one-third of the total job creation in the Euro Area (EA) occurred in Spain. However, during the current crisis, Spain has recorded the highest rate of job destruction, particularly with regards to temporary jobs, thus leading to a huge increase in the unemployment rate from 8% in 2007 to 23% in 2011.[1] According to Costain et al. (2010), Spain provides a high degree of external protection, but only for workers in permanent contracts (PCs), a factor that partially explains the enormous volatility in employment. The big gap in severance costs of permanent and temporary contracts (TCs) induces firms to use TCs as the basic mechanism of adjustment, instead of adjusting hours and wages, that cannot be easily changed since they are governed by collective agreements and are independent of a firm’s economic conditions.

Given the huge increase in the unemployment rate and guided by the idea of “flexicurity" (See, for example, Boeri et al. (2012), the actual government launched a far-reaching labour market reform (“the 2012 reform") through Executive Order 3/2012 in February 2012.[2] This reform has introduced major changes in external and internal flexibility by bringing them closer to the “modus operandi" of the rest of Europe. Regarding the external aspect, the gap in severance cost of PCs and TCs has been considerably reduced, a new permanent contract with substantial subsidies has been introduced and firings due to economic reasons have been made easier to implement. Regarding internal flexibility, the reform allows for an internal devaluation by facilitating the adjustment of hours and wages to changes in a firm’s economic conditions as an alternative to job destruction. For the first time, the firm will be able to unilaterally modify working conditions, such us hours worked and wages, when subject to negative shocks.[3] Moreover, the reform introduces important changes in the system of collective agreements: first, priority has been given to firms’ collective agreements; second, opt-out clauses have been introduced for firms experiencing economic difficulties; and third, the automatic extension of collective agreements once they expired has been reduced to one year. These

[1] The Spanish Labour Force Survey shows that during the first three years of the current crisis (2008-2010), more than two-thirds of the total number of dismissed workers had a temporary contract.

[2] The Executive Order 3/2012 has been followed by the Law 3/2012, July the sixth, of Urgent Measures to Reform the Labor Market.

[3] The Law 3/2012 establishes a maximum working week of 40 hours but allows the firm to unilaterally redistribute 10% of weekly hours on a yearly basis.

changes will improve the way firms adapt to changing economic conditions and will preserve firm's specific investment in human capital.

The objective of this paper is to evaluate the effects of allowing for more flexibility regarding weekly hours worked on the working-week, employment, output, productivity and wages for the Spanish case.[4] For that purpose I use a business cycle model, developed in Osuna and Ríos-Rull (2003), where plants face idiosyncratic shocks and, consequently, the workweek varies across plants. In this model the workweek and employment are imperfect substitutes for the following two reasons: *(i)* coordination needs (team work) or fatigue; and *(ii)* adjustments costs, modelled as congestion based commuting costs.

By team-work, I mean that a plant can only be operated when all its workers are present, and hence, that the length of the workweek is common to every worker in the plant. Consequently, when a plant changes its workweek, the amount of capital available to each worker does not change. On the other hand, when a plant changes the size of its labor force, the amount of capital available to each worker also changes. This implies that workweek length and employment are imperfect substitutes, inducing a form of decreasing returns to employment that do not apply to the workweek.

On the other hand, congestion based commuting costs are used to impose further restrictions on the substitutability of hours and employment. Commuting implies that workers have to use a certain amount of time before they provide any labor services.[5] Furthermore, I assume that commuting generates an externality and that, consequently, commuting costs are increasing in employment.[6] The imperfect substitutability between employment and hours per worker introduces a non convexity in the choice set that I deal with, following Hansen (1985) and Rogerson (1988), by assuming that agents have access to employment lotteries.

Apart from these two features, the model is a standard business cycle model except for the inclusion of a tax on deviations above the legal workweek. I calibrate a baseline model economy so that it reproduces the cross-sectional distribution of workweeks across plants and households and some features of the Spanish economy. In addition to the standard steady-state properties, I also target the relative volatility of employment and hours per worker (a business cycle statistic))

[4] García-Pérez and Osuna (2012) evaluate the effects of the 2012 reform concerning external flexibility.

[5] Commuting costs should not be taken literally. They stand in for all the frictions that limit the substitutability between the workweek and employment. The advantage over alternative mechanisms, such as the existence of adjustment costs to move in and out of the labor force, are the serious technical difficulties that these other frictions pose that prevent their use in models that aggregate nicely into the representative agent construct.

[6] See Osuna and Ríos-Rull (2003) for a discussion of why these further restrictions are so important to calibrate the model to the right degree of substitutability between the workweek and employment.

to get a tight measurement of the parameters that govern the friction. I then compare the steady–state status quo, where a 40 hour workweek is imposed and no flexibility is allowed, with the steady state of economies with a higher degree of flexibility in weekly hours worked: the 2012 reform, the worksharing and the full flexibility scenarios. I find that the 2012 reform preserves employment and generates a 1.72% increase in productivity. In the worksharing scenario, the increase in employment (1.86%) comes at the expense of a lower productivity increase (1.31%) and a decrease in weekly hours worked of 4%. Finally, the full flexibility scenario preserves employment and generates a substantial increase in productivity (2.6%) by allowing firms to completely adapt to changing economic conditions, by expanding or contracting the working week. As a robustness check, I also perform similar exercises for economies characterized by different degrees of teamwork and adjustment costs.

The outline of the paper is as follows. Section 2 briefly describes the baseline model without idiosyncratic shocks and then expands the model to include idiosyncratic shocks.[7] Section 3 discusses the calibration. Section 4 reports the results for the model where plants face idiosyncratic output shocks. Finally, Section 5 offers some concluding comments.

2 The Model

Section 2.1 describes households and preferences and Section 2.2 the technology. Sections 2.3– 2.4 describe the problems firms and households solve. Section 2.5 defines equilibrium recursively in a way that is suited for computation. Sections 2.6 expands the economy to include overtime taxes. Finally, Section 2.7 extends the economy to have shocks to firm specific productivity.

2.1 Households and Preferences

There is a continuum of *ex-ante* identical agents of measure one, with preferences given by

$$E\left\{\sum_{t=0}^{\infty} \beta^t \; u(c_t,\ell_t)\right\} \tag{1}$$

where c_t is consumption and ℓ_t is leisure in period t. The instantaneous utility function is strictly concave and satisfies the Inada conditions. Finally, $\beta \in (0,1)$ is the subjective time discount factor.

[7] A more formal description can be found in Osuna and Ríos-Rull (2003)

An individual's time endowment in each period is one. The amount of time that can be allocated to work is $1-\ell-\eta(N)$, where $\eta(N)>0$ measures the amount of time required for commuting to work every period that the individual is employed, and where N is aggregate employment. I am assuming that there is congestion which creates a negative externality in employment. In particular, I assume that $\eta(N)>0$, and $\eta'(N)>0$. Notice that $\ell(h,N)$ is not a continuous function since if hours worked are zero, no commuting is needed. This introduces a non-convexity.

2.2 Plant's Technology

Production takes place in plants of which there may be a large number. Moreover, new plants can be opened at zero costs. Plants are operated during a number of hours that is the same for all workers. Plants also use capital and they are restricted to have one shift.[8] The plant's production function f can be written as

$$f(z,h,k,n) = z h^{\xi} k^{1-\theta} n^{\theta} \tag{2}$$

where h denotes the workweek, n employment and k the amount of capital. Variable z represents total factor productivity and is used to incorporate shocks to productivity that are assumed to follow a first order Markov process. Capital depreciates geometrically at rate δ.

2.3 The Firms' Problem

The problem of a firm with an h hour workweek is the following

$$\max_{k,n} \; z h^{\xi} k^{1-\theta} n^{\theta} - k(r+\delta) - n\, w_h \tag{3}$$

where r is the rental rate of capital (the interest rate) and w_h the salary paid to a worker who works for h hours. Note that given the workweek, plants are subject to constant returns to scale. This implies that I can normalize the size of a firm to have one employee that works h hours. For any given r, I can solve

$$\max_{k} \; z h^{\xi} k^{1-\theta} - k(r+\delta) - w_h \tag{4}$$

with solution given by $k(z,h,r)$. Given free entry, the zero profit condition requires that the salary for workweek w_h satisfies

$$0 = z h^{\xi} \left[k(z,h,r)\right]^{1-\theta} - k(z,h,r)(r+\delta) - w_h \tag{5}$$

[8] I chose this technology to capture how this policy affects firms that need to increase their labor force for pick demand reasons.

2.4 Households Choices

Households choose probabilities over a per-period consumption possibility, C, that is indexed by aggregate employment in the period.[9]

$$X(N) = \{ \quad x \text{ is a probability}, \; i.e.\, x \geq 0, \; \text{and} \; x(C) = 1, \qquad \text{If} \; h \in (0,1], \; \text{and} \, x([0,\bar{c}],[h,1]) > 0, \; \text{then} \; h \leq 1 - \eta(N) \} . \tag{6}$$

A household that chooses x has indirect instantaneous utility function given by

$$U(x,N) = \int_C u[c, \ell(h,N)] \; dx. \tag{7}$$

The budget constraint is

$$\int_C c\, x(dc,[0,1]) \; + a' = (1+r) \; a + \int_C w_h \, x([0,\bar{c}],dh) \tag{8}$$

where a denotes households assets and a' savings. Since working does not have dynamic implications (a period later agents with wealth a' are identical regardless of what was the labor situation today) all agents with the same assets choose the same savings independently of the outcome of the lottery.

For computational reasons, it is convenient to define an indirect current return function R that takes as given the saving behavior of the household and solves for the optimal x. This static household problem given the saving behavior is

$$R(a,N,w_h,r,a') = \max_{x \in X(N)} \qquad U(x,N) \tag{9}$$

$$\text{s.t.} \qquad \int_C c\, x(dc,[0,1]) \; + a' = (1+r) \; a + \int_C w_h \, x([0,\bar{c}],dh)$$

where $x(a,N,w_h,r,a')$ is the optimal choice for a household with a assets, that saves a', when aggregate employment is N, and prices are given by function w_h and by r. An important property of $x(a,N,w_h,r,a')$ is that it has positive mass in at most two points[10], one of which is $\{c,0\}$ where $c \in [0,\bar{c}]$. I denote by $h(a,N,w_h,r,a')$ the point with positive mass in $h > 0$ and by $n(a,N,w_h,r,a')$ the mass at that point.

[9] In this economy with non-convexities, there are efficiency gains from the introduction of lotteries. See Hansen (1985), Rogerson (1988) and Prescott and Ríos-Rull (1992) for earlier applications of lotteries to labor contracts.

[10] This is a property derived from a standard result in linear programming (See Hornstein and Prescott (1993).

2.5 The Recursive Problem

Equilibrium is defined recursively. The aggregate state variables are total factor productivity z and aggregate capital K. The household's individual asset level a is also part of the individual state vector. Households use functions $\{\phi_r, \phi_{w_h}, G_K, G_N\}$ to compute the values for $\{r, w_h, K', N\}$ needed to solve their maximization problems. The value function is

$$v(z,K,a;\phi,G) = \max_{a'} R(a,N,w_h,r,a') + \beta\ E\left\{v(z',k',a';\phi,G)|z\right\}$$

$$\begin{aligned}
&\text{s.t.} \\
r &= \phi_r(z,K) \\
w_h &= \phi_w(z,K,h) \\
K' &= G_K(z,K) \\
N &= G_N(z,K) \\
H &= G_H(z,K)
\end{aligned}$$

Let $a' = g_a(z,K,a;\phi,G)$ denote the solution to this problem. Substitution of this solution in (9) yields $x(z,K,a;\phi,G)$, and given that the solution to this problem has mass in at most two points, it also yields $h = g_h(z,K,a;\phi,G)$ and $n = g_n(z,K,a;\phi,G)$.

Definition 1 *A recursive competitive equilibrium is a set of decision rules for households $\{g_a, g_h, g_n\}$, a value function v, functions for aggregate variables $\{G_K, G_H, G_N\}$, for the interest rate $\phi_r(z,K)$, a wage schedule function $\phi_w(z,K,h)$, a measure of firms $\Psi(z,K)$, and a capital renting policy of the plants $k(z,r,h)$ such that* i) *the decision rules and value function satisfy $v(z,K,a;\phi,G)$,* ii) *the agent is representative, i.e. $g_a(z,K,K;\phi,G) = G_K(z,K)$, $g_h(z,K,K;\phi,G) = G_H(z,K)$ and $g_n(z,K,K;\phi,G) = G_N(z,K)$,* iii) *plants choose capital optimally and have zero profits,* i.e. *they solve* (4) *and* (5), iv) *the labor market clears,* i.e., *Ψ has mass in only one point with positive hours worked which is given by $G_H(z,K)$ and $\Psi[z,K,G_H(z,K)] = G_N(z,K)$, and* v) *the market for capital clears, $K = \Psi[z,K,G_H(z,K)] = \dot{k}[z,\phi_r(z,K),G_H(z,K)]$.*

A steady state for a deterministic version of this economy (a fixed value of total factor productivity $\bar{z}$) is a just a number K^* such that, when substituted in the above general definition of recursive equilibrium, satisfies

$$K^* = G_K(\bar{z},K^*), \tag{10}$$

in addition to all the requirements above.

2.6 The Economy with Overtime Taxation

An overtime tax is a policy $\tau(\bar{h},h)$ such that if $h > \bar{h}$ then firms have to pay $\tau(\bar{h},h)\cdot\hat{w}_h$ to the government, where $\hat{w}_h$ is the total payment that the firm has to make, $\hat{w}_h = w_h + \tau(\bar{h},h)\cdot\hat{w}_h$. Equation (3) becomes

$$\max_{k,n} \; z h^{\xi} k^{1-\theta} n^{\theta} - k(r+\delta) - n[\, w_h + \tau(\bar{h},h)\cdot\hat{w}_h] \tag{11}$$

Equations (4) and (5) also change in a similar fashion. An important feature of the computational procedure is that all the relevant objects that the agent face are differentiable. Therefore, I can use the first derivatives to help characterize the solution. To this end, I use a function τ that is differentiable at $h = \bar{h}$. The properties of this function are that $\tau(\bar{h},h) = 0$ if $h \leq \bar{h}$, $\tau(\bar{h},h) > 0$ if $h > \bar{h}$, $\lim_{h\to 1} = \bar{\tau}$, $\frac{\partial \tau(\bar{h},h)}{\partial h}$ is non decreasing.[11] Finally, I assume that all the proceeds of the overtime tax are redistributed lump sum to the households. In addition to the changes in the profit function of firms and in the budget constraint of the household, I have to add the following balanced budget condition for the government to the definition of equilibrium

$$T(z,K) = \tau[\bar{h}, G_H(z,K)] \tag{12}$$

2.7 The Heterogeneous Workweek Model

This section extends the baseline economy by adding shocks to firm's specific productivity to show the importance of having plant level flexibility regarding the number of hours worked. I assume that plants are subject to transitory shocks to plant level productivity, revealed after the workers have been hired but before production takes place, and independent from the economy wide productivity shock.[12] Consequently, the only margin that can be used to exploit this additional productivity change is to vary the plant's workweek, inducing cross–sectional variation of workweeks across plants. In this framework penalizing deviations from the legal workweek adversely affects the flexibility of firms to adjust their labor input to temporary changes in productivity (or demand).

The new plant level production function is given by

$$z s h^{\xi} k^{1-\theta} n^{\theta} \tag{13}$$

where all variables are as before except for the plant specific shock, s. The shock takes only finitely many values $s \in \{s_1, \cdots, s_{m_s}\}$ and is drawn from probability

[11] See Appendix B and Fig. B1 in Osuna and Ríos-Rull (2003) for the tax function's details.

[12] This shock could be interpreted as a demand shock, but it is simpler to specify it as a plant specific productivity shock.

distribution γ_s. This extension requires the indexation of agents' choices by the possible realizations of the shock, and also the firm's problem has to be rewritten as

$$\max_k \ zk^{1-\theta}\sum_s \gamma_s \ s \ h(s)^{\xi} - k(r+\delta) - w_{\{h(s)\}} \tag{14}$$

with solution given by $k(z,\{h(s)\},r)$.

The zero profit condition requires that for each vector $\{h(s)\}$, the salary $w_{\{h(s)\}}$ satisfies

$$0 = z[k(z,\{h(s)\},r)]^{1-\theta}\sum_s \gamma_s \ s \ h(s)^{\xi} - k(z,\{h(s)\},r)(r+\delta) - w_{\{h(s)\}} \tag{15}$$

The rest of the changes to adapt the model to the case with idiosyncratic shocks to firms is a tedious minor variation of the equations described above and I omit them for brevity.

3 Calibration

The model without idiosyncratic shocks is standard in all dimensions except for the existence of team work, the externality based commuting costs and the overtime tax.

Team work is described by the parameter ξ. When the team work parameter is equal to the labor share, $\xi = \theta$, the technology is the standard Cobb-Douglas case where hours and employment are perfect substitutes. When $\xi = 1$, the technology is linear: an increase in the workers' workweek results in an increase of output of the same proportion. This last case can be interpreted as an extreme case of team production or a case where workers are not subject to fatigue.

Regarding the externality based commuting cost, I assume that time spent in commuting is described by function $\eta(N) = A_N N^{\lambda}$. In particular, I assume that $\eta(N) > 0$, and $\eta'(N) > 0$.

With regard to the rest of the model, I choose the time period to be a quarter and I assume that household preferences can be described by the following standard Cobb-Douglas function in consumption and leisure

$$U(c_t,\ell_t) = \frac{\left[c_t^{\alpha}\ \ell_t^{1-\alpha}\right]^{1-\sigma} - 1}{1-\sigma} \tag{16}$$

where $0 < \alpha < 1$ and $\sigma > 0$.

Therefore, the model without idiosyncratic shocks has ten parameters. Two of those parameters characterize the process for the Solow residual, the auto–regressive coefficient ρ and the variance of the shock σ_ε that I take from Ortega

Table 1: Baseline Economy Parameters.

rho	σ_ε	ξ	A_N	λ	α	σ	δ	θ	β
0.95	0.007	.85	1.2	6.75	.3	1.5	.025	.63	.99

(1998). The baseline model has eight additional parameters: ξ, θ, δ, β, α, σ, A_N and λ that I calibrate imposing the following conditions:

1. The Spanish labor share: 63%.
2. The Spanish steady state yearly real interest rate of 1% .
3. The Spanish steady state consumption to output ratio: 0.75.
4. The Spanish steady state fraction of the working-age population who work: 62% in the period 2000-2010.[13]
5. A 40 hour workweek.[14] I assume that out of the 168 hours each week, 68 are devoted to sleep or personal care. This implies that workers work 40% of their time.
6. The percentage variation of usual workweek hours and standard hours amounts to 2.57%.[15]
7. The relative volatility of hours and employment is 0.6 as in the Spanish data (See Ortega (1998).[16]
8. Average commuting time of 6 hours a week (40 minutes each way).[17]

[13] The source of this data is the Spanish Labour Force Survey.
[14] The source of this data is the Spanish Labour Force Survey 2005-2010.
[15] The source of this data is the Spanish Labour Force Survey 2005-2010.
[16] A natural question in this context is to what extent can business cyles variation be informative about the substitutability between hours and employment, and how does it relate to alternative measurement procedures that draw on microeconomic observations to calibrate. See Osuna and Ríos-Rull (2003) for a justification of the validity of this calibration strategy.
[17] The source of this data is the Time Use Survey conducted by the National Statistics Institute.

Table 2: Weekly hours given $h_{legal} = 40$

$h_{legal} = 40$	h_{eff}	$\%obs$	h_{us}	$\%obs$
$\bar{h}_{h<40}$	29.4	7.4%	34.7	0.6%
$\bar{h}_{h=40}$	40	79.2%	40	87.6%
$\bar{h}_{h>40}$	47.4	13.4%	47.3	11.8%

$\bar{h}_{h<40}$: average working week conditioning on having worked less than 40 hours and on having a 40-hour legal workweek; h_{eff} and h_{us}: effective and usual working week.

3.1 Calibration of the Heterogeneous Workweek Economy

In order to calibrate the heterogeneous workweek version of the model, I use the cross–sectional distribution of workweeks of individuals as reported by the Spanish Labour Force Survey in the period 2005-2011. I use effective weekly hours: those hours that individuals report having worked in the reference week. The underlying assumption is that the cross–sectional distribution of workweeks in the data should provide an indication of the desired degree of flexibility regarding the workweek. That is, I am assuming that in the data firms are free to set a particular working-week, but once this working-week has been chosen, deviations are not allowed under the status quo.

Table 2 shows average effective and usual workweek hours for those that worked less than, equal to and more than forty hours a week, conditioning on having a forty-hour legal workweek. Table 2 shows that 7.4% declared having worked almost 30 hours in the reference week although their usual hours were almost 35. These differences in reported effective and usual hours indicate that something special might have occurred in the reference week. In fact, if we tabulate the reasons of having worked less than legal hours in the reference week, almost 70% are due to holidays. Moreover, 19% report having those differences because of “summer working time and flexible working time arrangements or similar". Since these two reasons are mixed in the same item, it is not possible to know how much of difference can be accounted for flexible working time arrangements. In fact, there is an item in the questionnaire considering reductions in the working week due to technical or economic reasons, and only 0.07% report having worked less because of that. From this evidence I conclude that firms might be institutionally very constrained when reducing the number of hours given shocks to productivity or demand. The fact that only 0.6% of the workers experienced differences between usual and legal hours reinforces this conclusion.

Regarding the degree of flexibility above the legal workweek, the evidence is a bit different. Table 2 shows that 13.4% reported having worked 47.4 weekly hours

Table 3: Workweek distribution.

	h_{eff}	$\%obs$	$\frac{h_{eff}}{\bar{h}}$	h_{model}	$\frac{h_{model}}{\bar{h}}$
$\bar{h}_{h<40}$	32	16%	0.67	31.8	0.79
$\bar{h}_{h=40}$	40	63%	0.98	40	0.99
$\bar{h}_{h>40}$	47	21%	1.17	46.5	1.16
$\bar{h}$	40.2	–	–	40.1	–

$\bar{h}_{h<40}$: average workweek conditioning on having worked less than 40 hours;
h_{model}: calibrated workweek distribution; $\bar{h}$: weighted average working week;

in the reference week conditioning on having a forty-hour legal workweek. The numbers are very similar if we look at usual hours and at the percentage of people that reported usually having worked more than the legal workweek. This indicates that overtime seems to be a usual way to adjust to changes in economic conditions. If we now look at the reasons of having worked more, 85% reported having worked overtime.[18]

In order to calibrate the model, I compute the average effective weekly hours for those who work less than, equal to and more than forty hours a week and the percentage of workers in each of these groups. I use these percentages as the weighs for a three-valued idiosyncratic process. The values of the three shocks are determined such that the model replicates the percentage deviation of each of the previously computed workweek averages with respect to the whole sample average in a scenario where firms are free to change the working-week when hit by a productivity shock. The calibrated cross-sectional hours distribution is such that 21% work 1.16 of mean hours, 63% work 0.99 and 16% work 0.79 of mean hours.

4 Main Findings

In this section I report the steady–state implications of allowing for more flexibility regarding weekly hours worked on the workweek, employment, output, productivity and wages for the heterogeneous workweeks model economy. I show three scenarios, along the steady state of the pre-reform economy, the status quo (SQ), where a 40 hour workweek is imposed ($\bar{h} = 40$) and no flexibility is allowed. In the first one, the *2012 Reform* scenario, firms are allowed to deviate by 10% from

[18] In the status quo I assume that hours cannot deviate above because given that the deviation is on average 7.5 hours, that only around 9% report having worked overtime, and that only 2/3 are paid, the difference with a 40 hour-workweek is not very important.

the established working week. In the second one, the *worksharing* scenario, I only restrict the degree of flexibility by penalizing long workweeks through overtime taxes. And, in the third one, the *full flexibility* scenario, I allow for a complete degree of flexibility in weekly hours worked. As part of my robustness tests, I also perform similar exercises for economies characterized by different degrees of teamwork and adjustment costs.

4.1 Baseline Steady-State Findings

The intermediate panel in Table 4 shows the results of the scenarios mentioned above for the baseline economy. In the 2012 reform scenario, I impose a floor of 36 weekly hours and look for the tax such that weekly hours worked are not greater than 44 hours, so that average weekly hours are the legal ones (40 hours a week) and hours do not deviate by more than 10% from the established working week. The tax on overtime turns out to be 8%. The reform does not affect aggregate employment because average weekly hours do not change. Capital and, as consequence, output and average consumption, increase (by 1.53%) because the flexibility to adapt to changing economic conditions induced by the reform allows the firm to allocate hours in a more productive way: that is, increasing hours when hit by a positive shock and decreasing hours in the opposite case. Given the increase in output and the constancy of hours and employment both, productivity and the wage, increase by the same amount, 1.72%.

In the worksharing scenario, I eliminate the floor on weekly hours worked, allowing for complete flexibility to the bottom while, at the same time, deviations above 44 hours are penalized through overtime taxes. I call this scenario the worksharing scenario because the increase in employment (1.86%) comes at the expense of a lower productivity increase (1.31%) compared to the 2012 reform scenario. It also implies a decrease in weekly average hours (by 4%), capital and output (by 0.82%) because firms take advantage of the full flexibility to the bottom, by reducing weekly hours worked (by 23.8%) when they are less productive, but do not increase hours too much (by 9.3%) when hit by a positive shock, giving up the gains in productivity of an increase in hours worked when they are more productive because overtime is penalized. On the other hand, wages and average consumption decrease due to the decrease in output and the increase in employment. Obviously, the higher the tax the greater the intensity of the worksharing policy.

In the full flexibility scenario, the liberalization of hours worked induces households to decrease weekly hours worked by 1.47% (from 40 to 39.4) because firms find optimal to reduce hours worked by 23% when hit by a negative shock and to increase hours worked by 15% when the opposite happens. Capital, output and average consumption increase by 1.36% because the flexibility induced by the policy allows the firm to allocate hours so as to maximize productivity. As a

Table 4: S-S effects - Team work

$\xi = .82$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	37.5	-6.34	37.8	-5.67
h^h	40.0	44.0	9.52	43.9	9.56	44.7	11.04
h^m	40.0	40.0	0	38.4	-4.09	38.5	-3.94
h^l	40.0	36.0	-10.5	30.2	-27.9	30.3	-27.7
N	62.7	62.6	-0.20	64.6	3.05	64.4	2.66
H	25.1	25.0	-0.20	24.3	-3.29	24.3	-3.01
Y	1.00	1.01	1.45	0.98	-2.30	0.98	-1.72
Y/H	1.00	1.02	1.65	1.01	0.99	1.01	1.29
w_h	0.76	0.78	1.65	0.72	-5.36	0.73	-4.38
$\xi = .85$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	38.4	-4.00	39.4	-1.47
h^h	40.0	44.0	9.52	43.9	9.34	46.4	14.9
h^m	40.0	40.0	0	39.9	-0.27	40.1	0.32
h^l	40.0	36.0	-10.5	31.5	-23.8	31.7	-23.3
N	62.7	62.6	-0.20	63.9	1.86	62.8	0.24
H	25.1	25.0	-0.20	24.5	-2.13	24.8	-1.23
Y	1.00	1.02	1.53	0.99	-0.82	1.01	1.36
Y/H	1.00	1.02	1.72	1.01	1.31	1.03	2.59
w_h	0.73	0.74	1.72	0.71	-2.73	0.74	1.12
$\xi = .88$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	39.4	-1.48	41.1	2.68
h^h	40.0	44.0	9.52	44.0	9.52	48.3	18.7
h^m	40.0	40.0	0	41.4	3.49	41.8	4.51
h^l	40.0	36.0	-10.5	32.8	-19.7	33.2	-18.7
N	62.7	62.6	-0.20	63.0	0.46	61.1	-2.48
H	25.1	25.0	-0.20	24.8	-1.02	25.1	0.20
Y	1.00	1.02	1.60	1.00	0.89	1.05	4.46
Y/H	1.00	1.02	1.80	1.02	1.92	1.04	4.26
w_h	0.70	0.71	1.80	0.70	0.35	0.75	6.94

$\bar{h}$:average working week; h^h,h^m,h^l: working week in the high, medium and low productivity state; H: total hours worked; Y: output; Y/H: productivity.

consequence, wages and productivity increase by 1.12% and 2.59%, respectively. This scenario can be viewed as one that preserves employment and generates an important increase in productivity by allowing firms to completely adapt to changing economic conditions (expanding or contracting the working week). Comparing with previous scenarios this option would be the best in terms of the productivity increase (and the second, in terms of employment), but at the expense of increasing inequality measured as the standard deviation of consumption, 2.71%.

4.2 Robustness

Degree of Teamwork

To explore the role of the team work parameter in shaping the findings, I pose two additional economies, one with a lower and another with a higher ξ, whose results are also shown in Table 4. The $\xi = .82$ economy could resemble sectors where jobs are subject to a high degree of fatigue (or to a low need to coordinate activities) and, consequently, where it is better to increase employment instead of making the workers work for longer hours. When this is the case both, the worksharing and the full flexibility scenarios, display a larger increase in employment, 3.05% and 2.66%, respectively, and a larger decrease in weekly hours, 6.34% and 5.67%, respectively.[19] For instance, the liberalization of weekly hours (full flexibility scenario) implies larger reductions of hours worked when the firm is hit by an adverse idiosyncratic shock, 27.7%, against a 23.3% in the baseline and a 18.7% in the high ξ economy, and higher employment gains, 2.66%. In fact, in the full flexibility scenario, for ξ sufficiently high, employment decreases and weekly hours increase since firms take advantage of the possibility of making people stay for longer hours when hit by a positive shock (or by peak demands) because hours are very productive relative to employment and also because increasing hours is not penalized by overtime taxes. However, in the worksharing scenario, even for a high ξ, weekly hours do not increase because overtime taxes prevent a substantial increase in hours and adjustment to the bottom is flexible.

Regarding other variables of interest, output increase both, in the first and in the third scenario for ξ above the baseline value (in the second scenario only for ξ sufficiently high). The increase in output is greater the greater is ξ because hours are more productive relative to employment, and this effect tends to increase capital and, as a consequence, output, wages and average consumption. For ξ sufficiently low, both in the second and in the third scenario, the opposite happens: capital and average weekly hours worked decrease and employment does not compensate for

[19] Recall that in the first scenario, employment does not vary because weekly hours must average to 40 hours on a yearly basis.

Table 5: S-S effects- Adjustment costs

$\lambda = 6$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	38.8	-3.11	39.8	-0.40
h^h	40.0	44.0	9.52	44.0	9.63	46.8	15.6
h^m	40.0	40.0	0	40.3	0.68	40.5	1.36
h^l	40.0	36.0	-10.5	32.0	-22.2	32.2	-21.6
N	60.8	60.7	-0.19	61.6	1.34	60.6	-0.38
H	24.3	24.3	-0.19	23.9	-1.78	24.1	-0.78
Y	1.00	1.02	1.53	1.00	-0.25	1.02	2.18
Y/N	1.00	1.02	1.72	1.02	1.52	1.03	2.96
w_h	0.73	0.74	1.72	0.72	-1.65	0.75	2.55
$\lambda = 6.75$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	38.4	-4.00	39.4	-1.47
h^h	40.0	44.0	9.52	44.0	9.34	46.4	14.9
h^m	40.0	40.0	0	39.9	-0.27	40.1	0.32
h^l	40.0	36.0	-10.5	31.5	-23.8	31.7	-23.3
N	62.7	62.6	-0.20	63.9	1.86	62.8	0.24
H	25.1	25.0	-0.20	24.5	-2.13	24.8	-1.23
Y	1.00	1.02	1.53	0.99	-0.82	1.01	1.36
Y/N	1.00	1.02	1.72	1.01	1.31	1.03	2.59
w_h	0.73	0.74	1.72	0.71	-2.68	0.74	1.12
$\lambda = 7.5$	SQ	Ref.2012	%var	Worksh.	%var	Full flex.	%var
$\bar{h}$	40.0	40.0	0	38.2	-4.68	39.1	-2.40
h^h	40.0	44.0	9.52	43.9	9.34	46.2	14.3
h^m	40.0	40.0	0	39.6	-1.13	39.8	-0.59
h^l	40.0	36.0	-10.5	31.0	-25.2	31.2	-24.7
N	64.3	64.2	-0.20	65.8	2.28	64.8	0.81
H	25.7	25.7	-0.22	25.1	-2.42	25.3	-1.61
Y	1.00	1.02	1.52	0.99	-1.22	1.01	0.74
Y/N	1.00	1.02	1.72	1.01	1.18	1.02	2.33
w_h	0.73	0.74	1.72	0.70	-3.55	0.73	-0.07

because adjustment costs prevents employment from growing too much, so that output, wages and average consumption decrease.

Finally, productivity increases in every scenario and for any ξ, but a lower rate the lower the ξ. Note that, in the full flexibility scenario for the high ξ economy, productivity increases despite the increase in total hours because output increases substantially.

The policy implication of this analysis is that this sort of policies that are intended to increase productivity could decrease employment if the degree of team work is sufficiently high. That is, the higher the difference between the labor share (θ) and the degree of team work (ξ), the more attractive would be to increase the labor input by increasing the workweek instead of employment.

Degree of Adjustment costs

To explore the role of the adjustment costs parameter, I show the results for two additional economies, one with a larger degree of adjustment costs ($\lambda = 6$), and another with a lower one ($\lambda = 7.5$).

The quantitative effects of varying λ in the 2012 reform scenario are exactly the same as those in the pre-reform case because weekly average hours and employment do not change so that adjustment costs do not play any role. The key difference, though, is the initial level of employment. The lower the value of λ, the greater the adjustment costs and, as a consequence, the lower the initial employment level.

The qualitative effects of varying λ in the worksharing scenario are the same for all the variables of interest. The higher the value of λ, the lower the productivity gains and the greater the employment increase and the decrease in weekly hours, total hours, output, productivity and the wage. The reason is that lower adjustment costs make the hours adjustment margin relatively more expensive inducing less adjustment in hours when firms are subject to changes in economic conditions.

Finally, in the full flexibility scenario, output and productivity increase and weekly and total hours decrease both, for the low and for the high λ economy. These changes are greater the higher the adjustment costs (the lower the value of λ) because, then, hours are cheaper relative to employment and firms take advantage of the flexibility in allocating hours, and of the corresponding productivity gains.[20]. As a consequence, employment could decrease for λ sufficiently low.

[20] The result of a higher productivity increase for lower values of λ (higher adjustment costs) might not follow if both a dual labour market with permanent and temporary contracts differing in severance costs and firm's specific investment is modelled (See García-Pérez and Osuna (2012)

5 Conclusion

In this paper, I have looked at the implications for the working week, employment, output, productivity and wages of a policy that promotes internal flexibility by allowing firms to adapt the working week and wages to changes in economic conditions. As the Law 3/2012, on Urgent Measures for reforming the Spanish Labour Market, makes explicit in its preamble, the objective is to promote firm's internal flexibility as an alternative to job destruction.

The imperfect substitutability between hours per worker and employment has been modeled by means of team work and an externality-based commuting cost. As argued in Osuna and Ríos-Rull (2003), it is important to have a correct measurement of this degree of susbtitutability in the model to give an accurate assessment of the implications of these policies.

The model economy has been calibrated so that it reproduces the cross-sectional distribution of workweeks and some features of the Spanish economy. Then, I have compared the status quo steady–state, where a 40-hour workweek is imposed and no flexibility is allowed, with the steady–state of economies with a higher degree of flexibility in weekly hours worked: the 2012 reform, the worksharing and the full flexibility scenarios. I have found that the 2012 reform preserves employment and generates a 1.72% increase in productivity. In the worksharing scenario, the increase in employment (1.86%) comes at the expense of a lower productivity increase (1.31%) compared to the 2012 reform scenario and a decrease in weekly hours worked of 4%. Finally, the full flexibility scenario preserves employment and generates a substantial increase in productivity (2.6%) by allowing firms to completely adapt to changing economic conditions (by expanding or contracting the working week). Comparing with previous scenarios this option would be the best in terms of the productivity increase (and the second, in terms of employment), but at the expense of increasing inequality measured as the standard deviation of consumption, 2.71%.

Another policy implication of this analysis is that this sort of policies that are intended to increase productivity could have as an unintended effect the decrease in employment if the degree of team work and adjustment costs are sufficiently high because, then, hours are cheaper relative to employment and firms take advantage of the flexibility in allocating hours, and of the corresponding productivity gains.

There are some caveats to my findings. The first two were extensively discussed in Osuna and Ríos-Rull (2003). The first one arises from having used commuting costs subject to congestion as the friction that stands in for a variety of adjustment costs that are difficult to model appropriately. The second has to do with the use of business cycle properties to calibrate the extent of the frictions that determine the relative substitutability between hours per worker and employment. There is no doubt that my findings are affected by these assumptions even though in the paper (and also in Osuna and Ríos-Rull (2003)) I have explored a variety of alternative assumptions to give a sense of the range of possible values for the main variables of interest. I find that the answers encountered under these alternative assumptions are not very different from those that arise in the baseline economy. The third caveat has to do with the fact that this model does not account for the segmentation of the Spanish labour market due to the huge differences in severance costs of workers in permanent (PCs) and temporary contracts (TCs). In fact, the gap between the severance payments of workers with PCs (45 days of wages per year of seniority (p.y.o.s) for unfair dismissal) and temporary workers (8 days of wages p.y.o.s) accounts for almost one-half of the job destruction over the past four years, when temporary contracts (TCs) have been used as the basic adjustment mechanism because adjusting hours and wages was virtually impossible (see Bentolila et al. (2012)). As noted by Bentolila and Jansen (2012), the 2012 reform introduces interesting complementarities between internal and external flexibility, which are beyond the scope of this paper, although they are part of my research agenda. Hence, I consider the role of this paper to be a first step in the formal discussion about the possible implications of introducing more internal flexibility in the Spanish labour market.

References

Bentolila, S., Dolado, J., Cahuc P. and T. Le Barbanchon (2012). Two-Tier labour Markets in the Great Recession: France vs. Spain. *Economic Journal*, 122, F155-F187.

Bentolila, S. and M. Jansen (2012). La reforma laboral de 2012: Una primera evaluación. *Apuntes FEDEA-Laboral*, 14.

Boeri, T., J.I. Conde-Ruiz and V. Galasso (2012). The Political Economy of Flexicurity. *Journal of the European Economic Association*, 10-4, 684715.

Costain, J. Jimeno, J and C. Thomas (2010). Employment fluctuations in a dual labour market. *Documento de trabajo 1013, Banco de España*.

García-Pérez, J.I. and V. Osuna (2012). Dual labour markets and tenure distribution: reducing severance costs or introducing a single contract. *FEDEA WP 2012-09*.

Hansen, R. (1985). Indivisible Labor and the Business Cycle. *Journal of Monetary Economics*, 16, 309–318.

Hornstein, A. and Prescott, E. C. (1993). The Firm and the Plant in General Equilibrium Theory. *Edited by R. Becker and M. Boldrin and R. Jones and W. Thompson, Academic Press.*.

Kydland, F.E. and Prescott, E.C. (1991). Hours and Employment Variation in Business Cycle Theory. *Economic Theory*, 1, 63-81.

Ortega, E. (1998). The Spanish Business Cycle and its relationship to Europe. *Servicio de Estudios del Banco de España*.

Osuna and Ríos-Rull (2003). Implementing the 35 hour workweek by means of overtime taxation. *Review of Economic Dynamics*, 6, 179–206.

Prescott, E.C. and Ríos-Rull, J. V. (1992). Classical Competitive Analysis in Economies with Islands. *Journal of Economic Theory*, 57, 73–98.

Rogerson, R. (1988). Indivisible Labour Lotteries and Equilibrium. *Journal of Monetary Economics*, 57, 73–98.